1745

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First Named Inventor	Akashi
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Firm *or* Individual name	SONNENSCHEIN NATH & ROSENTHAL
Signature	Jeffrey J. Craft
Date	04/15/2003

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Docket No. 9792909-0336 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re U.S. Patent Application of:
Akashi *et al.*

Serial No.: 09/575,237 Examiner: C. Chaney

Filed: May 22, 2000 Group Art Unit: 1745

For: **SOLID ELECTROLYTE BATTERY**

RESPONSE

In response to the outstanding office action dated January 15, 2003, please consider the following remarks.

Independent claim 1 and dependent claims 2-10 are currently pending. Claim 1 recites a solid electrolyte battery **1** that includes a positive electrode **2** , a negative electrode **3**, and a separator **5** having opposing first and second surfaces, disposed between the positive electrode and the negative electrode. The solid electrolyte battery also includes a solid electrolyte layer **4** disposed adjacent to the first separator surface between the positive electrode **2** and the separator **5** and another solid electrode layer **4** disposed adjacent to the second separator surface between the separator and the negative electrode **3**. The separator is made of a polyolefin porous film having a thickness not less than 5 μm nor greater than 15 μm and a porosity not less than 25 % nor greater than 60 %.

Significantly, the impedance in the solid electrolyte battery is higher at a temperature not less than 100° C nor greater than 160° C than the impedance at room temperature. A description of one process that can be used to make separators having the claimed combination of properties, a solvent process, is found in the instant application, beginning at page 20, line 12.

The examiner rejected claims 1-10, all the claims, under 35 U.S.C. § 103(a) as obvious in light of Pendalwar *et al.* Reconsideration is respectfully requested. Nothing in Pendalwar *et al.* would have suggested a solid electrolyte battery that has both (1) a polyolefin film separator having a thickness of not less than 5 μm nor greater than 15 μm and a volume porosity of not

lower than 25 % nor higher than 60 % and (2) an impedance that is higher at a temperature not less than 100° C nor greater than 160° C than the impedance at room temperature.

In particular, applicants disagree with the examiner's assertion that, "In a preferred embodiment, the commercially available material Celgard 2300, was used as the inert separator." Instead, Pendalwar *et al.* teaches that, "In the preferred embodiment of the instant invention, the first polymer region [*i.e.*, the separator] is actually a *multilayered* polymer region comprising two or more different polymers. In the embodiment of FIG 2, the first region comprises *three* polymer layers . . ." (Emphasis added, col. 4, lines 25-29.)

As explained by Pendalwar *et al.*, it is a trilayered structure that provides shut down protection :

> "An advantage of the instant system is that the layers of the first region when heated above a threshold temperature, of example about 135 degrees Centigrade (°C.) for *polyethylene*, the material melts and fuses essentially choking off all ionic conductivity. . . . The benefit of providing the sandwiching layers of. [sic] for example, polypropylene, is to assure a continued electrical an physical barrier between the electrodes . . . Polypropylene remains relatively intact up to about 165° C."

(Col. 4, line 59-col. 5, line 7, emphasis added.)

Such a trilayered structure would not have suggested a solid electrolyte battery that has a polyolefin film separator having a thickness of not less than 5 μm nor greater than 15 μm and a volume porosity of not lower than 25 % nor higher than 60 % and that has an impedance that is higher at a temperature not less than 100° C nor greater than 160° C than the impedance at room temperature.

In the section entitled examples, Pendalwar *et al.* describes the preparation of a cell containing a single layer of Celgard® 2300, a conventional polypropylene material. However, this example is not of a preferred embodiment, but of a comparative example. In FIG. 5, Pendalwar *et al.* reports, "Results for the trilayer and the conventional polypropylene materials" and states that "Shutdown" in the trilayer occurs at a much lower temperature (i.e. 135° C)" (Col. 6, lines 15-19.) This temperature is much lower than the temperature of 165° C which Pendalwar *et al.* teaches is the temperature at which conventional polypropylene begins to melt.

Applicants' understanding of the properties of the comparative example described in Pendalwar *et al.* is consistent with the description of Celgard products contained in US 6,322,923, the Lundquist *et al.* patent cited by the examiner in the previous office action. Lundquist *et al.* generally describes the properties of microporous membranes made by the Celgard process, a dry stretch process. Lundquist *et al.* then goes on to identify a number of patents that describe microporous membranes that can function as shut down separators. The patents appear to describe multilayer separators.

Therefore, Pendalwar *et al.* would not have suggested a solid electrolyte battery that has a polyolefin film separator having a thickness of not less than 5 μm nor greater than 15 μm and a volume porosity of not lower than 25 % nor higher than 60 % and that has an impedance that is higher at a temperature not less than 100° C nor greater than 160° C than the impedance at room temperature, so that the rejection of claims 1-10 under 35 U.S.C. § 103(a) as obvious in light of Pendalwar *et al.* should be withdrawn.

CONCLUSION

In light of the foregoing amendments, remarks, and substitute specification, it is believed that the application is in condition for allowance, so that a prompt and favorable response is earnestly requested.

Respectfully submitted,

SONNENSCHEIN NATH & ROSENTHAL

By: _____
Jeffrey F. Craft
Registration No. 30,044

SONNENSCHEIN NATH & ROSENTHAL
P.O. Box # 061080
Wacker Drive Station
Sears Tower
Chicago, IL 60606-6404
(213) 623-9300

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April 15, 2003 Kathleen Gaines
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